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(54) Asset assessment system using digital camera and GPS

(57) The present invention relates to an asset assessment system. The system comprises a memory means (8), a taking means(2) in the form of a digital video camera for taking a real time image of an asset to be assessed, a differential global positioning system receiving means (3) located in the vicinity of the taking means to provide a real time absolute position value representing an absolute position of the receiving means and a control means (7) to store to said memory means a file comprising said real time image of the asset and a position value evaluated according to said real time absolute position value. A retrieval means is provided to retrieve stored files from said memory means.

The system may be mounted on a train.

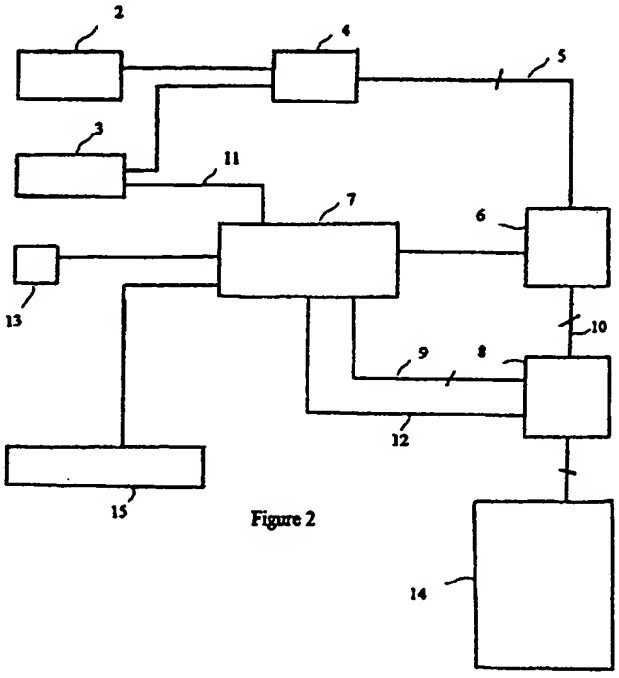

Figure 2

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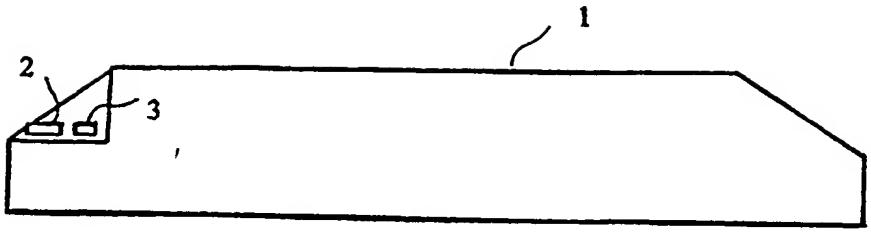

Figure 1

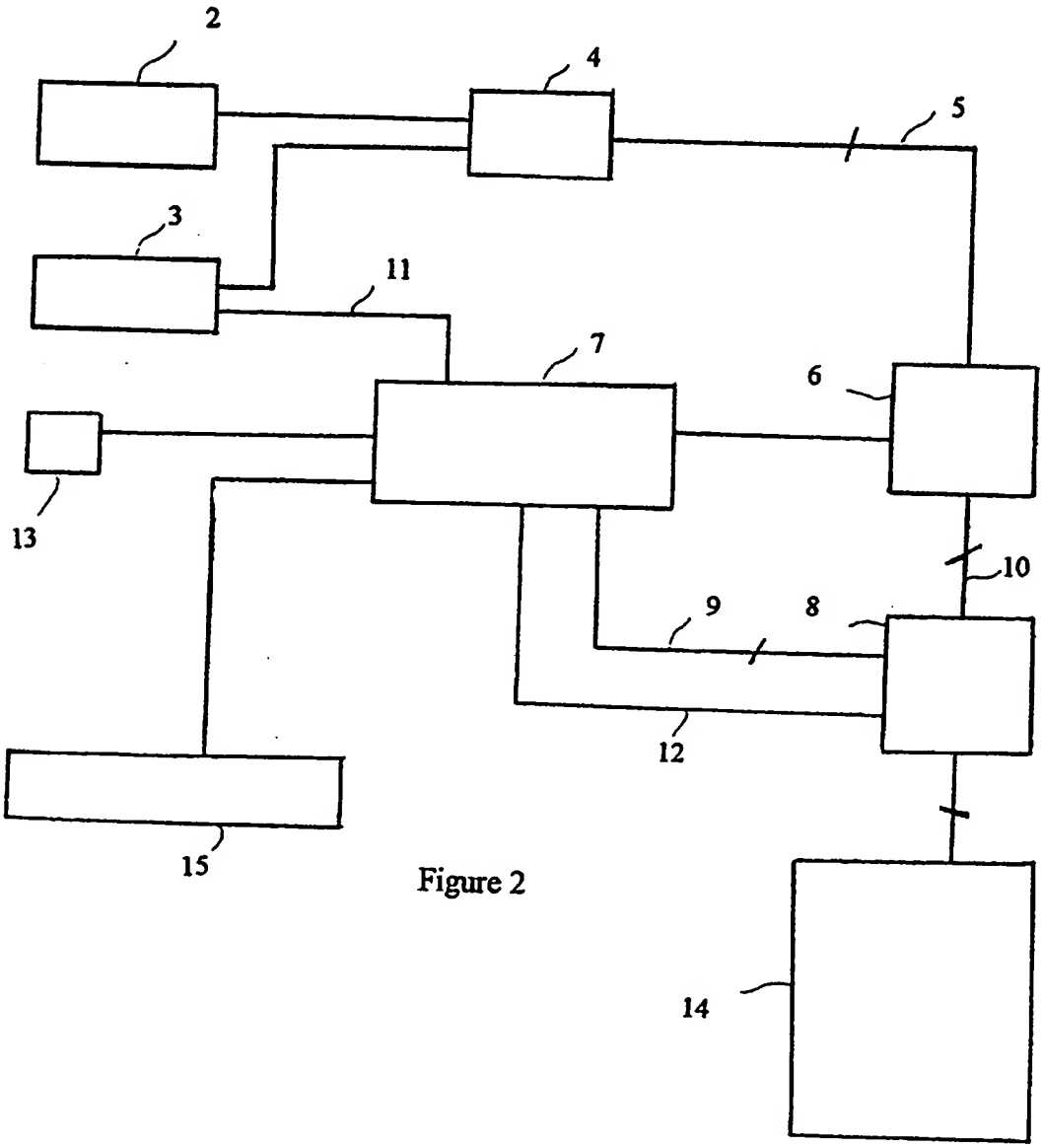

Figure 2

ASSET ASSESSMENT SYSTEM

The present invention relates to an asset assessment system.

In order to assess and monitor the progress of asset based projects or in order to assess the value of the assets of companies, there is an increasing need to keep a comprehensive inventory relating to the assets, for example, what the assets are, where is their precise location, and what is their condition. This becomes particularly important in cases where the capital value of the assets is large, where the number of assets is large, or where those assets are widely distributed sometimes in remote locations.

Hitherto, information about assets have generally been kept as numbered files which include specifications, map references, technical drawings, plans, descriptions of the asset etc. An elementary database relating an asset name and the file number is made to enable retrieval of the file for the particular asset. However, such information is not easily or rapidly collectable and retrievable. Furthermore, such information is historical. To update the information and assess the current state of the asset, it has been necessary to send personnel to view the asset in question, draw up new specifications and positions, prepare new descriptions etc. This is time consuming and labour intensive and has tended to discourage the active assessment of assets. Thus, many projects and companies have no ongoing comprehensive inventory of their assets.

It is therefore an object of the present invention is to provide an asset assessment system enabling simple and rapid collection of images of assets and their position and simple and rapid retrieval of those images notwithstanding the location of the asset.

It is a further object of the present invention is to provide an asset assessment system which allows further information of an asset to be added from other sources without

detriment to the simple and rapid retrieval of that information.

According to one aspect of the present invention there is provided an asset assessment system comprising:-

a memory means;

taking means for taking a real time image of an asset to be assessed;

a differential global positioning system receiving means located in the vicinity of the taking means to provide a real time absolute position value representing an absolute position of the receiving means;

a control means to store to said memory means a file comprising said real time image of the asset, and a position value evaluated according to said real time absolute position value; and

retrieval means to retrieve stored files from said memory means.

In this way, real time images of assets can be stored in a manner enabling indexing by position values evaluated according to absolute positions determined by the global positioning system. Thus, the precise geographical and spatial positions of assets can be obtained. This enables any variations or absences of assets to be easily detectable in a subsequent assessment of the assets. In addition, the files can be stored in a rapid and cost effective manner notwithstanding that the assets may be in a remote location.

Preferably, said control means stores said real time image of the asset superposed with said position value.

Consequently, the actual real time image bears the position value making checking of the image quick or alteration of the image difficult reducing the likelihood of fraud.

Conveniently, said taking means has a predetermined spatial relationship with respect to said receiving means.

Accordingly, the position value stored can be a value relative to the taking means or an absolute position.

It is preferred that said taking means is provided at or

immediately adjacent said receiving means and said stored position value is said real time absolute position value.

This simplifies the geographical location of assets.

In one embodiment, said taking means comprises a digital video camera.

Thus, the real time image is in the correct form for storing to the memory means.

Preferably, said memory means comprises a hard disk or writable CD ROM.

It is preferred that the file stored to said memory means by said control means includes additional information fields.

In a particular embodiment, the system further comprises:-

information adding means for adding extra information relevant to the real time image of a file into said additional fields of that file.

Consequently, a more detailed inventory of assets can be obtained.

It is preferred that at least one said additional information field comprises an asset classification field.

Accordingly, retrieval of files can be based on asset classification enabling an optimum use of the stored information about assets with simplified retrieval.

Conveniently, an attitude sensor is provided for sensing the orientation of the taking means. Readings from such an attitude sensor can provide enhanced results, particularly where the system is not used along predetermined or fixed linear paths or tracks.

Preferably, said control means stores files according to a determined time interval.

In this way, an area can be scanned for assets.

In one embodiment, the system further comprises a vehicle to which said taking means and receiving means are mounted.

This simplifies the system.

In an alternative embodiment, at least the receiving means and the taking means are provided as part of a helmet and/or backpack arrangement. Such an arrangement is suitable

for use, e.g. on a construction site where portability is advantageous. With such an embodiment a pair of spectacles may be provided having viewing alignment means associated with attitude (orientation) and/or altitude sensors. Preferably, an on-off switch is provided to facilitate use of the system.

According to a further aspect of the present invention there is provided apparatus for assessing assets comprising:-

a memory means;

taking means for taking a real time image of an asset to be assessed;

a differential global positioning system receiving means located in the vicinity of the taking means to provide a real time absolute position value representing an absolute position of the receiving means;

an attitude sensing means for sensing an attitude of the taking means; and

a control means to store to said memory means a file comprising said real time image of the asset, a position value evaluated according to said real time absolute position value and an attitude of the taking means.

Conveniently, the apparatus takes the form of a helmet and/or backpack arrangement, the taking means, the receiving means and the attitude sensing means being housed in said helmet and/or backpack.

Preferably, the apparatus further comprises a pair of spectacles having viewing alignment means associated with said attitude sensor and/or an altitude sensor.

According to another aspect of the present invention there is provided a method of assessing assets, the method comprising:-

obtaining a real time image of an asset;

obtaining a real time absolute position value representing an absolute position of a differential global positioning system receiving means;

storing to a memory means a file comprising the obtained real time image of the asset, and a position value evaluated according to the obtained real time absolute position value;

and

retrieving stored files from said memory means.

An example of the present invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 illustrates a train which carries an asset assessment system of the present invention;

Figure 2 illustrates a block diagram of the asset assessment system of figure 1.

Figures 1 and 2 illustrate an asset assessment system of the present invention as applied to assessing assets of a railway company.

Referring to figure 1, a digital video camera 2 is located at the front of a train 1 and is arranged to have a predetermined angle of view. Immediately alongside the camera, there is located a differential global positioning system (DGPS) receiver 3 which provides an position output value representing the absolute position of the receiver 3 and hence the camera 1 alongside.

Referring to figure 2, the video image obtained by the camera 2 is output to an image processing unit 4 together with an output from the DGPS receiver 3. The image processing unit 4 provides an output along bus 5 which comprises the current video image obtained overlaid with the position output value provided from the DGPS receiver 3. Thus, the video image always shows the position output value. The bus 5 is connected to a switching unit 6 which is controlled by a central controller 7. A hard disk or a writable CDROM memory 8 is connected by a bus 9 and line 12 to the central controller 7 and is connected by a bus 10 to receive the output from the switching unit 6 . The central controller is connected to receive the position output value from the DGPS receiver 3 along line 11.

As will be explained more fully hereinafter, the central controller periodically provides a write signal on line 12 to actuate the memory 8 to write the output of bus 9 and 10 to memory at a predetermined file location. In this way, series of files are written to memory each comprises a field

containing the position output value and a field containing a currently obtained video image overlaid with the position output value.

To operate the system, the train 1 is first located at the start position for asset data collection. Then, a collection rate is determined. This represents the file storage rate. This can be evaluated on the basis of a simple time interval between each file storage, say store 1 file at 10 second intervals, or it can be linked in to the travel speed of the train by attaching the output of a speedometer 13 to the controller 7 so that the time interval between storage decreases with increasing train travel speed. It will be appreciated that the file storage can be manually controlled.

When the train starts up, the central controller 7 is actuated to start storing files. Thus, as the train travels along the track, files are stored which contain the current DGPS defined position and the current video image. In this way, real time images assets along the track and their current position are easily and rapidly stored simple by running the train along the track.

As the information is stored in memory 8, or after storage, a user can access the stored files by entering the position output value via keyboard 15. The central controller 7 then retrieves the stored video image from the memory 8 and displays it on display 14. The user can then enter asset classification or identification data to be written by the central controller into the file corresponding to that displayed on display 14. Such identification data can for example define whether the asset is a bridge, signal, pylon, station, etc. In this way, an accurate real time inventory of the assets along the particular track is provided notwithstanding that the assets are in a remote location. In addition, since identification data are now stored in the asset files, it is possible to retrieve images of, say all the bridges along certain parts of the track between defined DGPS position values.

It will be appreciated that each file can have further defined fields for additional information which can be stored either at the time when the train is running along the track, for example, automatically storing current time and date, or can be stored subsequently, for example, by entering in construction details and specification manually or by scanning. In this way, a detailed and comprehensive inventory of the assets can be provided.

As described above, image data can be stored to memory together with positional and time data. In this respect, digital image data is generally provided in a four field format, so that the relevant positional and time data (and indeed any further useful data in digital format) can be added in one or more of the fields together with the image data. Where the assets being recorded are afforded a particular digital identification address that is recorded in one or more of the fields together with the relevant image data, such assets can be quickly retrieved at their specific digital address and once located, all relevant information pertaining to those assets is readily to hand.

Searching engines such as Oracle and Elustra can be employed to carry out searching of the data stored in the memory, with the possibility of direct access via the internet.

It will be appreciated that the above described procedure can be repeated at a different time, for example after repair work months later. The later and earlier images can be retrieved in a split screen format according to DGPS position, and/or asset classification to ensure that assets are correctly positioned and/or are not missing. Thus, the present system is extremely flexible in its applications.

For example, the camera 2, preferably a digital camera, and receiver 3 could be provided in a device mounted to large post for assessing assets during a construction project. The controller 7 may operate to write the output on bus 10 to the memory 8 say once a day or by using time lapse cameras. Thus, each file comprises an image of the project for the current

day so that it is possible to retrieve from the store 8 information representing the ongoing construction of the project thereby enabling careful assessment of the asset and to enable quick action to be taken to head off possible construction mistakes.

Where the device is used in a non-linear context, for example on a construction site where the device is not necessarily moved about the site along predetermined linear patterns, an electronic compass may additionally be provided for upgrading the data so that it includes values for orientation (attitude). So as to further enhance the results, the device may further include an altimeter, perhaps a laser range finder and/or an attitude meter.

It will be appreciated that the system shown in figure 2 can be a single unit, or can comprise a cental unit receiving the camera output and GPS receiver output. In addition, the memory 8 could be removable for the addition of extra information to the files subsequently.

It will be appreciated that the storage of the files on the memory 8 can take many forms and such storage can use known data compression techniques. In one case, a hard disk of 6 Gbyte capacity is used wherein each file requires 1 Kbyte of memory so in excess of half a million files can be stored.

It will be understood that the embodiment illustrated shows an application of the invention in one form only for the purposes of illustration. In practice the invention may be applied to many different configurations, the detailed embodiments being straightforward for those skilled in the art to implement.

For example, in a construction site context, the system may take the form of a helmet and/or backpack device associated with a pair of spectacles or the like. The spectacles may have cross-hairs or other viewing alignment means that are themselves associated with sensors for measuring attitude and/or altitude, by way of an electronic compass, preferably including a gyroscope, and/or altitude or attitude meters. A hand-held on-off switch may be provided to

facilitate operation of the device.

An engineer can thus walk around the site, photographing those things of interest, the resultant associated positional and time data taken by the device being stored in the memory means of the device together with the digital image data. The data may be fed into, e.g. an "oracle" searching system which can then rework the data into a form which is readily retrievable.

CLAIMS

1. An asset assessment system comprising:-

a memory means;

taking means for taking a real time image of an asset to be assessed;

a differential global positioning system receiving means located in the vicinity of the taking means to provide a real time absolute position value representing an absolute position of the receiving means;

a control means to store to said memory means a file comprising said real time image of the asset, and a position value evaluated according to said real time absolute position value; and

retrieval means to retrieve stored files from said memory means.

2. A system according to claim 1 wherein said control means stores said real time image of the asset superposed with said position value.

3. A system according to claim 1 or 2 wherein said taking means has a predetermined spatial relationship with respect to said receiving means.

4. A system according to claim 3 wherein said taking means is provided at or immediately adjacent said receiving means and said stored position value is said real time absolute position value.

5. A system according to any preceding claim wherein said taking means comprises a digital video camera.

6. A system according to any preceding claim wherein said memory means comprises a hard disk or writable CD ROM.

7. A system according to any preceding claim wherein the file stored to said memory means by said control means includes additional information fields.

8. A system according to claim 7 further comprising:-

information adding means for adding extra information relevant to the real time image of a file into said additional fields of that file.

9. A system according to claim 7 or 8 wherein at least one said additional information field comprises an asset classification field.

10. A system according to any preceding claim further comprising an attitude sensor for sensing the orientation of the taking means.

11. A system according to any preceding claim wherein said control means stores files according to a determined time interval.

12. A system according to any preceding claim further comprising a vehicle to which said taking means and receiving means are mounted.

13. A system according to any one of claims 1 to 10 wherein at least the receiving means and the taking means are provided as part of a helmet and/or backpack arrangement.

14. A system according to claim 13 wherein the system further comprises a pair of spectacles having viewing alignment means associated with attitude and/or altitude sensors.

15. A system according to claim 13 or 14 further comprising an on-off switch.

16. Apparatus for assessing assets comprising:-

a memory means;

taking means for taking a real time image of an asset to be assessed;

a differential global positioning system receiving means located in the vicinity of the taking means to provide a real time absolute position value representing an absolute position of the receiving means;

an attitude sensing means for sensing an attitude of the taking means; and

a control means to store to said memory means a file comprising said real time image of the asset, a position value evaluated according to said real time absolute position value and an attitude of the taking means.

17. Apparatus according to claim 16 wherein the apparatus takes the form of a helmet and/or backpack

arrangement, the taking means, the receiving means and the attitude sensing means being housed in said helmet and/or backpack.

18. Apparatus according to claim 17 further comprising a pair of spectacles having viewing alignment means associated with said attitude sensor and/or an altitude sensor.

19. A method of assessing assets, the method comprising:-

obtaining a real time image of an asset;

obtaining a real time absolute position value representing an absolute position of a differential global positioning system receiving means;

storing to a memory means a file comprising the obtained real time image of the asset, and a position value evaluated according to the obtained real time absolute position value; and

retrieving stored files from said memory means.

20. A system substantially as hereinbefore described with reference to the accompanying drawings.

21. Apparatus substantially as hereinbefore described with reference to the accompanying drawings.

22. A method substantially as hereinbefore described with reference to the accompanying drawings.

The Patent Office

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Application No:	GB 9708453.7	**Examiner:**	Paul Nicholls
Claims searched:	1 - 22	**Date of search:**	16 July 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4A (AUXF, AUXX)

Int Cl (Ed.6): G06F 17/30, 17/60

Other: Online: WPI, BUSSOFT, COMPUTER, CMP, KR TELECOM

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	Electronics, Vol 65, No 16, Nov 23, 1992, page 16 (See especially paragraph 6)	1-9, 12, 19
X	Newsbytes, Nov 16, 1992, Ian Stokell, "Trimble & IBM ally in mobile computing venture" (See especially paragraphs 4 and 5)	1-9, 12, 19
X	Computer Graphics World, Vol 15, No 10, Oct, 1992, Laura Lang, "GIS comes to life: multimedia links to GIS applications create new avenues for exploration", pages 27 - 31 (See especially paragraph 26)	1-9, 12, 19

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.